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Comments on the Draft Alternatives Screening Technical Memorandum Prepared by Geo-Hydro Inc. on behalf of People in Need of Environmental Safety

Geo-Hydro Inc. (GHI) is submitting the following comments on the draft Alternatives Screening Technical Memorandum for the Pines Area of Investigation dated June 2012, on behalf of People In Need of Environmental Safety (PINES). Our general and specific comments on that document are provided below. The comments identify the most significant technical issues associated with the remedial action objectives (RAOs). GHI will further address these with PINES as the RI/FS process continues and concludes, thereby allowing PINES to fulfill its obligations to the public under the TAP.

General Comments

1. The draft Alternatives Screening Technical Memorandum provides the PRPs' rationale for essentially doing no meaningful remediation of the Pines site. Despite the elevated concentration of CCB-related contaminants detected in the soil, sediments, surface water and groundwater around the area of investigation, this document claims that meaningful remedial options are a combination of 1) not an option since the site is regulated by IDEM, 2) not necessary because the site is already closed and environmental contamination is controlled, and 3) not implementable due to "extensive effort" and high cost. None of these claims is correct and none is likely to be accepted by the public. Effective remediation of contaminants in the Area of Investigation, as required by the Remedial Action Objectives (RAOs), is justified by the levels of CCB-derived contamination observed. That justification is further enhanced by the many areas and levels of uncertainty identified during the Remedial Investigation and Risk Assessment phases of this project.

Specific Comments

1. **Section 2.1.3, Page 2-2** – The last paragraph of this section describes supposed differences in Coal Combustion Byproduct (CCB) composition between waste observed in Yard 520 and that observed during water service installation. The description of the "soupy or muddy" composition of CCBs in Yard 520 highlights the fact that that the soil cover placed over Yard 520 during facility closure is ineffective at minimizing infiltration of precipitation into the disposed waste. Without an adequate cap infiltration of precipitation will continue and CCB-derived contaminants will continue to drive leachate formation and migration. Lack of a functioning landfill cap was independently documented during the Remedial Investigation (RI) with measurement of increasing leachate head and development of a leachate mound within Yard 520 at piezometer PZ001 during its brief existence. If Remedial Action Objectives (RAO's) 1, 5 and 6 are to be achieved, a functioning landfill cap is a necessary component of contaminant containment.

Outside of Yard 520 the available groundwater monitoring data show that the disposed CCBs are capable of degrading groundwater quality. Infiltration of precipitation through significant CCB deposits located outside of Yard 520 must be controlled or eliminated if Remedial Action Objectives 1, 5, and 6 are to be achieved.

2. **Section 2.2.2, Page 2-6** – This section reports that five of the 25 "background"[1] soil samples (20%) were tested for the presence of CCBs. The results of this testing showed that 60% of the tested samples contained CCBs.[2] One sample contained 1% CCBs, and 2 samples contained <1% CCBs. The subsequent assessment of the significance of CCB on "background" soil chemistry assumes there is an upper bound of 1% CCB content for the entire population of CCB-impacted background samples. In effect, the assessment assumes that one of the five samples analyzed serendipitously identified *the* most heavily impacted sample of the entire population. The discussion provides no rationale supporting this assumption. Subtracting the contribution of 1% CCBs from the background dataset is not appropriate unless it can be shown that 1% CCB actually represents the highest concentration of CCBs in background soil samples and the composition of the CCBs present in the "background" soil samples has been demonstrated. Please identify each of the samples analyzed, the locations from which they were collected, and the amount of CCBs present in each sample on a map that also displays all of the "background" soil samples. The concentration of CCB constituents should be plotted against the percent CCB in each sample to visually assess the potential impact of CCB contamination on the background dataset. Alternatively, develop background soil water composition from soil samples that do not have CCBs in them.

3. **Section 2.2.3, Page 2-7** – Future changes to human health risk-based comparison levels are possible for many contaminants as the science progresses. Decisions on current sites cannot be predicated on potential changes that may or may not be made at some future date. In directed changes to the Human Health Risk Assessment, EPA identified the absence of hexavalent chromium analyses from groundwater and surface water as a data gap expected to bias low the risk assessment results. This is an example of the many areas of uncertainty that must be considered when formulating remedial alternatives that satisfy the RAOs.

4. **Section 2.2.4, Page 2-7** – In this section the Respondents assert that, at Yard 520, arsenic "is not transported any significant distance with the groundwater." While arsenic may not currently have migrated to the location of many of the wells in the surrounding neighborhood, it has been shown to be present in monitoring wells located outside of the waste management boundary of Yard 520 and its current mobility must be reduced. Further, the RI/FS has not identified where the CCB-derived arsenic is currently being sequestered and fails entirely to discuss the geochemical conditions under which any sequestered arsenic will remobilize. The document also identifies

[1] The "background" samples were identified as unimpacted based upon an initial criterion of no CCBs observed upon simple visual observation.

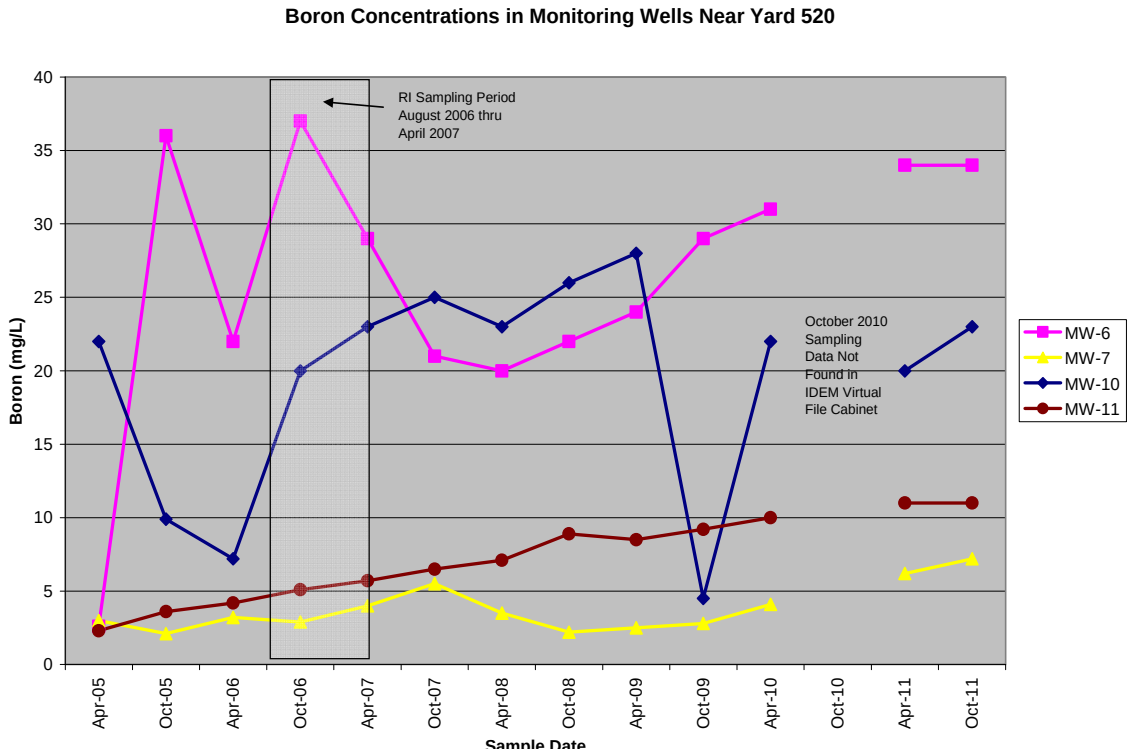
[2] The distribution of CCBs among the five samples may be important to consider, as well. Soil samples (2) with granular texture universally showed CCBs present. The remaining three samples, only one of which had CCB evident, were described as 'peat' and had 70% to 96% organic material. The limited data suggest the significance of the data relative to soil type is yet to be established.

selenium and chloride as constituents detected at concentrations above comparison levels but indicates that these parameters are not likely to be CCB-derived. Both selenium and chloride are contaminants that are very commonly associated with CCB leachates. Simply because other potential sources of these contaminants may be present in the general area does not mean that Yard 520 and other CCB source area are not contributing significant concentrations of these parameters to the groundwater now, or may do so as CCBs in the area break down by weathering.

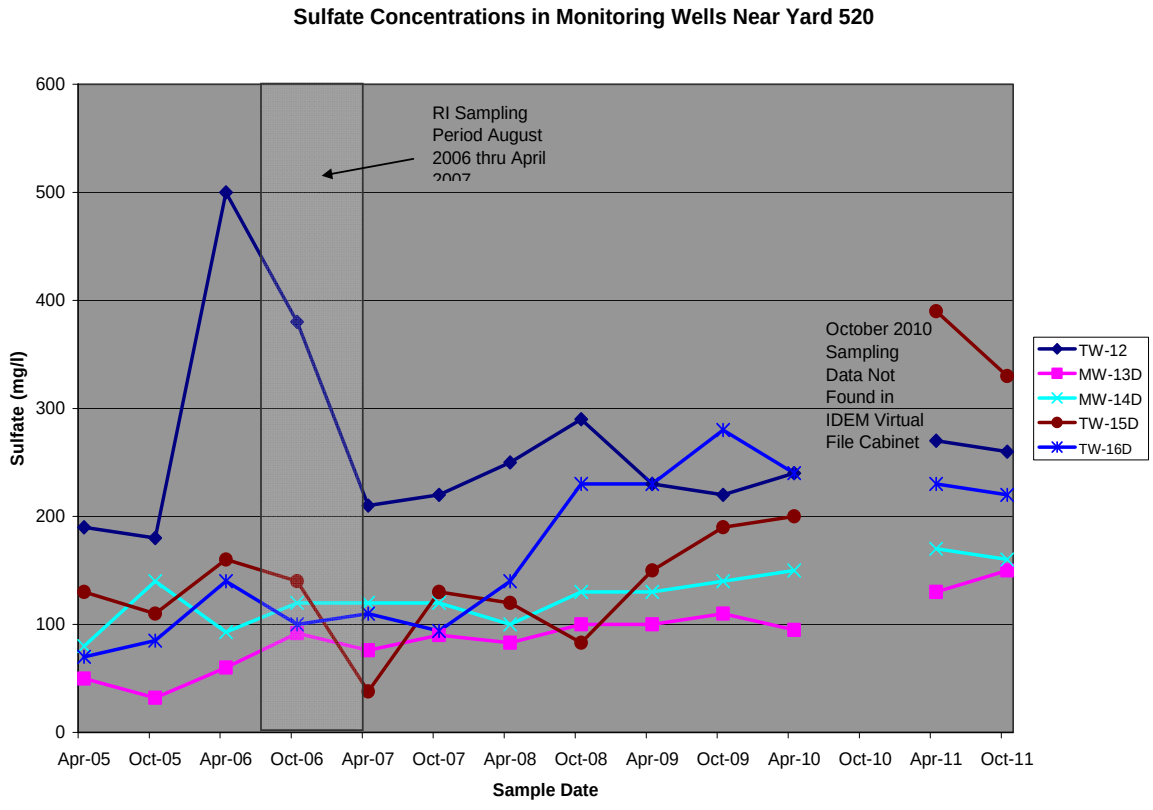
5. **Section 2.2.4, Page 2-8** – Contrary to the description presented in this section, Figure 9 shows that elevated boron concentrations extend toward the north from both Yard 520 and other smaller waste disposal areas toward IDNL. The only way to truthfully say that all groundwater containing CCB-derived constituents flows towards and into the Brown Ditch System is to redefine IDNL wetlands as part of Brown Ditch and ignore the impacted groundwater that flows toward Derby Ditch and into the Great Marsh.

6. **Section 2.2.4, Page 2-9** – The discussion of hydraulic gradients and boron concentrations presented in this section is misleading. A statement is made that "Overall, there has been no significant change in groundwater levels or hydraulic gradients since completion of the RI field work." There are no data to justify this statement, but, as discussed below, there are data that refute it. During the RI, rapidly increasing leachate head within North Yard 520 was documented in the only piezometer (PZ001) capable of measuring changes in head within the landfill. This piezometer was immediately abandoned following completion of RI sampling events, allowing no possible inference that head levels had reached the maximum and subsequently remained static. GHI has repeatedly warned that concentrations of CCB-related contaminants in groundwater may increase outside the landfill units over time solely due to the observed increase in mounded leachate elevation. Concentration increases may be compounded as disposed CCBs continue to weather and chemically evolve. Increasing leachate head within the landfill will have the effect of driving more flow of leachate outward in all directions, including toward the north and northwest toward IDNL, and increasing concentrations of CCB-related contaminants in groundwater over that observed during the RI.

   In order to investigate recent changes in groundwater quality in the immediate vicinity of Yard 520 GHI accessed semi-annual monitoring results submitted to IDEM. Reported boron and sulfate concentrations from a subset of monitoring wells located in the immediate area of North Yard 520 were plotted. The plot of reported boron data (below) shows that concentrations have remained very high in some wells (MW-6 and MW-10) and has been generally increasing in others (MW-7 and MW-11) since the RI sampling program was completed. This indicates that contrary to the description of declining boron concentrations provided in the Alternatives Screening Memorandum, areas impacted by CCB-derived constituents in some wells near the source are increasing as anticipated.



The plot of reported sulfate data (below) shows generally increasing sulfate concentrations in each plotted well since the RI sampling program was completed. This data provides another indication of increasing CCB-derived groundwater impacts in the vicinity of Yard 520.



These data plots do not represent a comprehensive evaluation of groundwater quality since completion of the RI. They simply provide an indication of the misleading nature of the discussion of post-RI sampling results presented in the Alternatives Screening Memorandum. If left unchecked, increased concentrations of CCB-related contaminants coupled with increasing leachate head and CCB diagenesis will spread CCB-relate contaminants in all directions from Yard 520, leading to increased concentrations of these constituents in wells at greater distances from the landfills.

7. **Section 2.3.4.2, Page 2-18** - Future Scenario for the Groundwater Pathway – The same comments supplied in comment #6 apply to this section. This section also states, "there is no information that would suggest that these conditions would change dramatically in the future." The cited lack of information results from decisions made by the PRP's to 1) eliminate PZ001 as soon as RI sampling was completed, 2) not produce a technically defensible groundwater model with which to be able to investigate future groundwater flow and contaminant transport, and 3) not collect samples of leachate from the Yard 520 source to evaluate CCW diagenesis and evolution of source chemistry over time. The noted lack of information is the result of not looking rather than a scientifically defensible demonstration that changing conditions will not occur. The future scenario for the groundwater pathway is a source of uncertainty that calls for a selection of robust remedial alternatives.

8. **Section 2.4.3.2, Page 2-22** – See comment #5 and #6.

9. **Section 4.0, Page 4-2, RAO 4** – The presentation of RAO 4 included in this document omits reference to COC constituents near the ground surface. EPA's RAO 4 clarifications date June 13, 2012 specifically included COC concentrations at **or near** the ground surface. The CCB visual inspection program consisted of visual observations of only the top 6-inches of soil. The failure of this protocol to identify CCBs in a significant percentage of a subset of surface soils is discussed in Specific Comment 2, above. Near surface CCB's below the top 6-inches have had *no* characterization in areas outside the footprint of the municipal water supply extension and represents a significant uncertainty.

10. **Section 6.1**, **Table 7, Containment: Cap** - Table 7 indicates that an "engineered cap" is currently in place over Yard 520. Review of closure documents included in IDEMs Virtual File Cabinet show that 2-feet of "clayey soil" covered with 6-inches of topsoil was placed as final cover over waste disposed in Yard 520. That final cover has been shown to be ineffective at minimizing infiltration of precipitation into the waste. Measurements showing rapidly rising leachate head and formation of a leachate mound within Yard 520 were collected as part of the RI. CCBs within Yard 520 are characterized by the PRPs consultants as *soupy* and *muddy* (Specific Comment 1, above). In order for the existing soil cover to address the groundwater impacts observed at wells MW-3, MW-6, MW-8, MW-10, TW-12, TW-15D, TW-16D, TW-18D, and MW122, it would have to be effective, something that is obviously not true. It is unclear why the respondents judge the existing soil cover at Yard 520 to be effective at addressing groundwater impacts at Yard 520, but

claim that capping areas outside of Yard 520 would be ineffective. Installation of an effective cap system over CCBs disposed in Yard 520 and other areas could be effective at minimizing mobility of CCB-derived constituents as required by ROA 1 and should be retained for further evaluation.

11. **Section 6.1**, **Table 7, Containment: Passive (Groundwater) –** The fact that IDEM regulates Yard 520 has no bearing on the range of issues that can be considered to contain CCB-related constituents. More importantly, the current and future concentration and extent of CCB-derived constituents in groundwater have not been controlled under the rubric of IDEM regulation of the facility (See comments 5 and 6). To suggest that remedial alternatives be off limits at this point in deference to IDEM oversight is to ignore the elephant in the room. The fact that CCBs have been disposed below the water table in the unlined North Yard 520 means that the mobility of CCB-derived constituents cannot be reduced and RAOs 1 and 3 cannot be achieved without containment or ex-situ removal/treatment. The PRPs propose to eliminate passive containment because it would be "difficult to construct" and the cost would "likely be greater than the benefits provided." These are incorrect statements. There are no technical barriers that would preclude construction of a passive containment system. As for the relative benefits provided, the benefit to the citizen's of Pines of having their environment restored is far greater than the costs to properly contain the CCB-derived constituents. Passive containment should be retained for further evaluation as a method to achieve RAOs 1 and 3.

12. **Section 6.1**, **Table 7, Containment: Active (Groundwater) -** See comment 11. Additionally, the idea that active containment options should be eliminated on the basis of "extensive effort" is outrageous. None of the identified difficulties render active containment unimplementable. There may be other options that upon further evaluation turn out to be more cost effective, but options should not be eliminated on the basis of the level of effort required. Active containment should be retained for further evaluation as a method to achieve RAOs 1 and 3.

13. **Section 6.1**, **Table 7, Ex-situ Removal/Treatment (Groundwater)** – See comment 11. It is correct that groundwater extraction and treatment would be most effective when combined with source removal or containment. However, there are no technical issues that would preclude its implementation. Groundwater extraction and treatment may be a viable option to bring down contaminant concentrations outside of passive containment systems within a reasonable timeframe as required by ROA 3 and should be retained for further evaluation.

14. **Section 6.1**, **Table 7, Ex-situ Soil Removal (Soil/Groundwater) –** As discussed in comments 11 through 13 above, The fact that IDEM regulates Yard 520 has no bearing on the range of issues that can be considered, including CCB removal. Contrary to what is stated in Table 7, removal of CCBs from the area of investigation would be a very effective method to permanently remove CCBs and eliminate potential mobilization of CCB-related COCs to groundwater now and in the future. While more cost effective alternatives may ultimately be selected, there are no technical impediments that make ex-situ soil removal unimplementable. Ex-situ removal of CCBs both inside and outside of Yard 520 should be retained for further evaluation.

15. **Section 6.1, Table 7, Monitored Natural Attenuation (MNA)** – MNA is nothing more than letting current and potentially higher levels of contamination exist far into the future. Groundwater located downgradient of Yard 520 would not have been contaminated over such a large area if natural attenuation had been an effective mechanism for removing CCB-derived contaminants in this geologic environment. The current and future concentration and extent of CCB-derived constituents in groundwater have not been, and will not be controlled by natural attenuation (See comments 5 and 6). Further, attenuation of inorganic contaminants, like those from CCB, when it does occur, represents a sequestration that is reversible as water chemistry changes with time. What is sequestered today can become mobile tomorrow. The fact that CCBs have been disposed below the water table in the unlined North Yard 520 means that the mobility of CCB-derived constituents cannot be reduced and RAOs 1 and 3 cannot be achieved without some form of containment or ex-situ removal/treatment. MNA may be appropriate for monitoring residual CCB-related contaminants in groundwater outside the footprint of future containment systems and should be retained for further evaluation only in this context. Issues related to the current monitoring system are detailed in comment 19.

16. **Section 6.2, Table 8**, **Containment** – Each of the proposed alternatives falsely indicate that containment of the CCB-derived contaminants in Yard 520 is in place (See comments 10 and 11). Containment is not present unless it is properly functioning. In the case of Yard 520, the final cover has been shown to be ineffective in controlling infiltration into the landfill mass, groundwater that has been impacted by contact with disposed CCBs is completely uncontrolled, and the extent and magnitude of groundwater contamination have increased since the RI period. The alternatives make no proposal for containing contaminants from CCB deposits located outside of Yard 520. RAO's 1 and 3 cannot be achieved without some form of functioning containment or removal/treatment.

17. **Section 6.2, Table 8**, **Monitored Natural Attenuation –** See comment 15.

18. **Section 6.2, Table 8**, **Monitoring –** The monitoring system will require significant modifications before the public can rely on the information that is developed. This lack of confidence in monitoring is partially a result of the failure to acknowledge and, in cases to detect, contaminant releases and failure to trigger actions to contain releases when contaminants were initially released from Yard 520. The result was that residents were exposed to various contaminated media for years before action was finally taken. The entire Pines groundwater plume problem could have been avoided had the monitoring system been sufficiently robust and submitted data been appropriately scrutinized as contaminants were initially being released from Yard 520.

    Lack of confidence in the monitoring system continues to date because recent monitoring reports submitted to IDEM have been woefully inadequate in characterizing groundwater flow directions and identifying CCB impacts. Data developed during the RI established a large and growing[3] leachate mound within North Yard 520 that drives flow from the landfill in all directions including toward the north and northwest, exactly opposite of the flow direction indicated in recent

[3] This is the condition at the time RI observations were ended and the piezometer was removed.

monitoring reports. Groundwater monitoring reports submitted to IDEM since October 2008 (after abandonment of PZ001) identify the direction of groundwater flow around North Yard 520 as being from off-site areas to the north, through the landfill toward the southwest and southeast, as if the known leachate mound within North Yard 520 has disappeared. Flank discharge of leachate from Yard 520 demonstrates the mound within the landfill remains. Wells identified in the monitoring reports as upgradient wells are in fact downgradient of the landfill and statistical comparisons of supposedly upgradient and downgradient water quality are comparing impacted wells against one another.

Monitoring will be necessary, but the monitoring system will have to include multiple monitoring wells completed within the mass of waste disposed in both North and South Units of Yard 520 landfill to monitor leachate head and changes in leachate chemistry as the disposed CCBs weather and evolve. Additional monitoring wells are needed to the north and northwest of Yard 520 to enable detection of CCB-related constituents traveling through that area and toward IDNL. Firm target concentrations for each monitoring point need to be established that will, if reached, trigger additional predefined remedial actions. Finally, future monitoring reports must be carefully reviewed by an independent third-party that has the time and budget to identify future issues as they develop, with a functional mechanism to initiate further remedial alternatives that address such issues.

19. **Section 6.2, Table 9**, **Land Use Controls –** Placing land use controls in the form of deed restrictions on area properties amounts to placing a burden (depressed property values) on owners of nearby property owners in order to justify no meaningful remediation of Yard 520 and other areas. Short term land use controls may be necessary in some locations until installed remedial systems have had time to improve groundwater quality, but long term (i.e., perpetual) restrictions on neighboring properties would be to shift the costs of PRP actions onto surrounding property owners.

20. **Section 6.2, Table 9**, **Monitored Natural Attenuation –** See comments 15 and 18.

21. **Section 6.2, Table 9**, **Soil Removal –** See Comment 9.

22. **Section 6.2.1, Page 6-2, Alternative 1: No Further Action -** Contrary to what is stated in this section, adequate closure of Yard 520 has not been completed (See comment 10) and completion of the MWSE has not eliminated potential future use of groundwater for drinking in all areas of the Area of Investigation. Future development of drinking water in areas already known to be contaminated or potentially contaminated in the future is not eliminated.

23. **Section 6.2.2, Page 6-2, Alternative 2: Land Use Controls –** See comments 18, 19, and 22.

24. **Section 6.2.3, Page 6-2**, **Alternative 3: Monitored Natural Attenuation** – See comments 15, 18, 19 and 22.

25. **Section 6.2.4, Page 6-3**, **Alternative 4: Additional Data Evaluation and Review –** See comments 2 and 9.